Polar Knowledge Canada

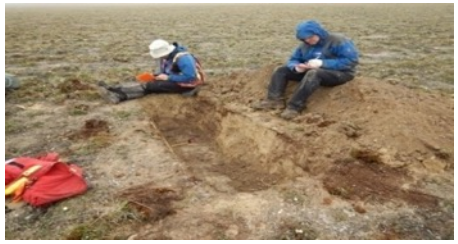
Canadian Federal Agency and POLAR Airborne Science Contributions

January 18 2017
Arctic-Boreal Vulnerability Experiment – Airborne Planning Meeting

Pan-Northern S&T Program

Priority Areas for 2014-2019:

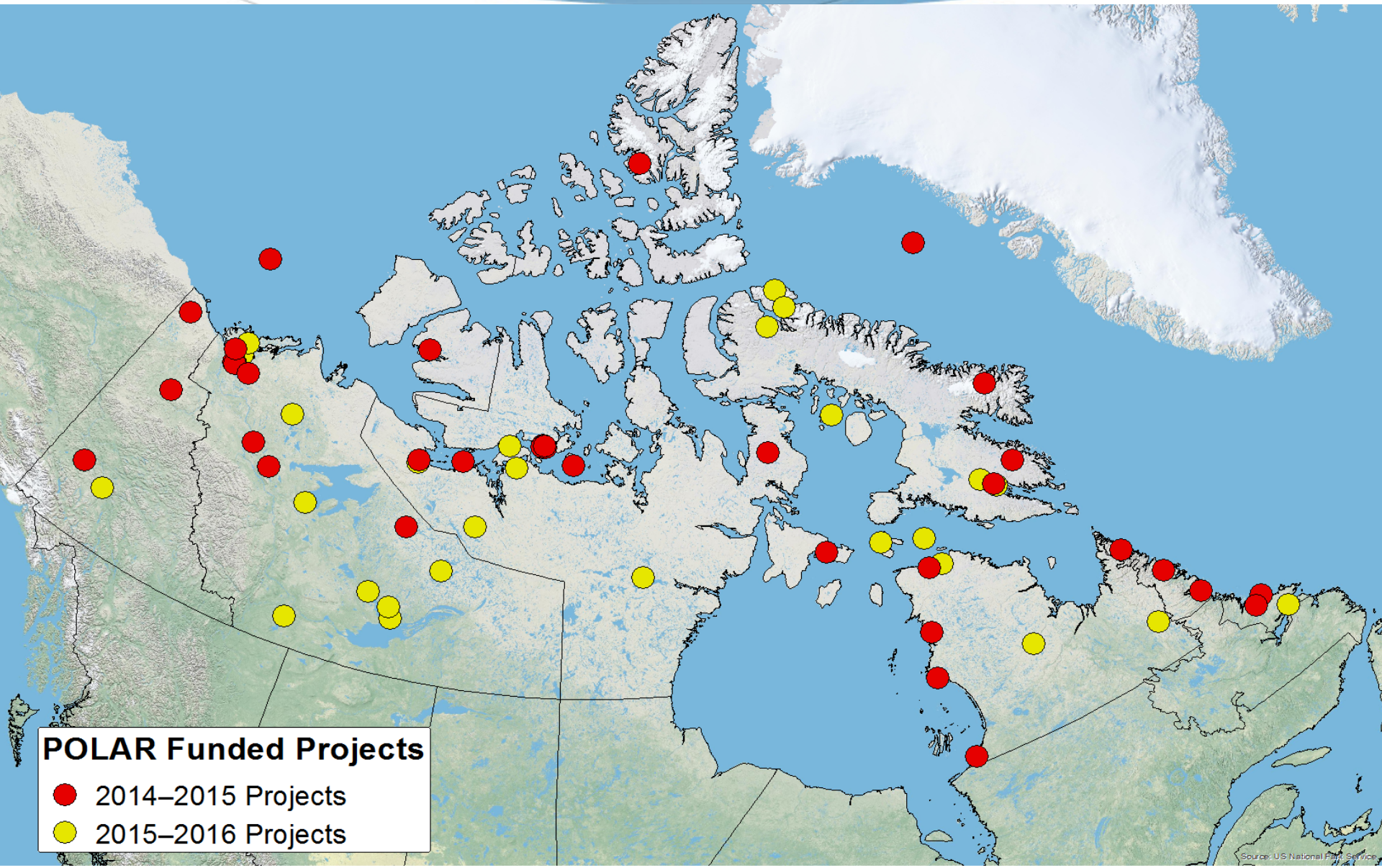
- **Alternative and renewable energy for the North**
  - Reduce the dependency on high-cost imported energy, explore feasibility of local sources and enhance northern application of alternative technologies
- **Baseline information to prepare for northern sustainability**
  - Improve decision support for sustainable communities and responsible development in Canada's North
- **Predicting the impacts of changing ice, permafrost, and snow on shipping, infrastructure and communities**
  - Increase knowledge of terrestrial and marine cryosphere to support adaptation and improve climate models
- **Catalysing improved design, construction and maintenance of northern built infrastructure**
  - Application of innovative designs, materials and techniques to increase energy efficiency, quality, and reduce life-cycle costs



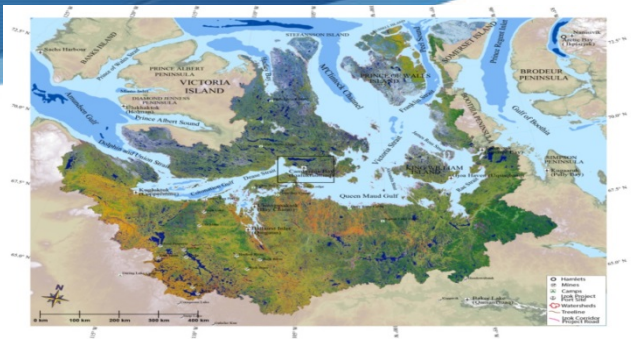
POLAR Contributions to ABoVE

- 19 multi-year funded projects:
  - 13 in the ABoVE domain (Boreal and Arctic)
  - Many address ABoVE science objectives (e.g. Fire in the Arctic, Caribou, Shrub monitoring, Veg-cryosphere-freshwater, etc.)
- ABoVE theme in current POLAR funding call (2017-2019)
- POLAR led process for collecting/coordinating Canadian Airborne needs and contributions
- POLAR and NASA are assisting the Canadian Space Agency for RadarSat-2 tasking within the ABoVE domain
- POLAR is willing to work with NASA and Cdn partners to coordinate ground observations within the Cdn portion of domain

POLAR funded projects to date



POLAR Needs & Contributions: Exp'tl Reference Area

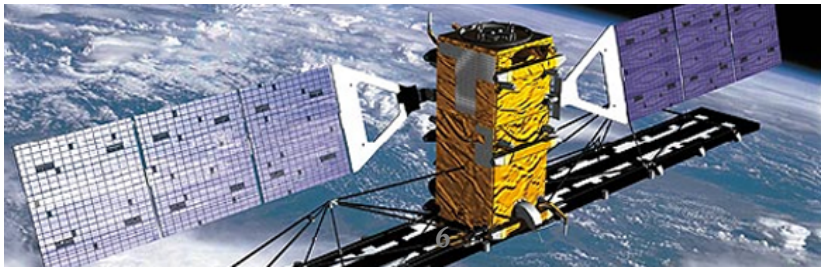


- **Intensive, year-round research and monitoring**:
  - Regional-local ecosystem mapping,
  - PF Sensitivity mapping and ALT;
  - Veg change (biomass, species composition, community physiognomy),
  - CO2/CH4 flux and local-regional soil C stores;
  - Soil temperature and moisture and ALT;
  - Caribou/muskoxen, waterfowl and shorebird habitat change;
  - Snow characteristics and phenology; and,
  - Arthropod phenology and species composition

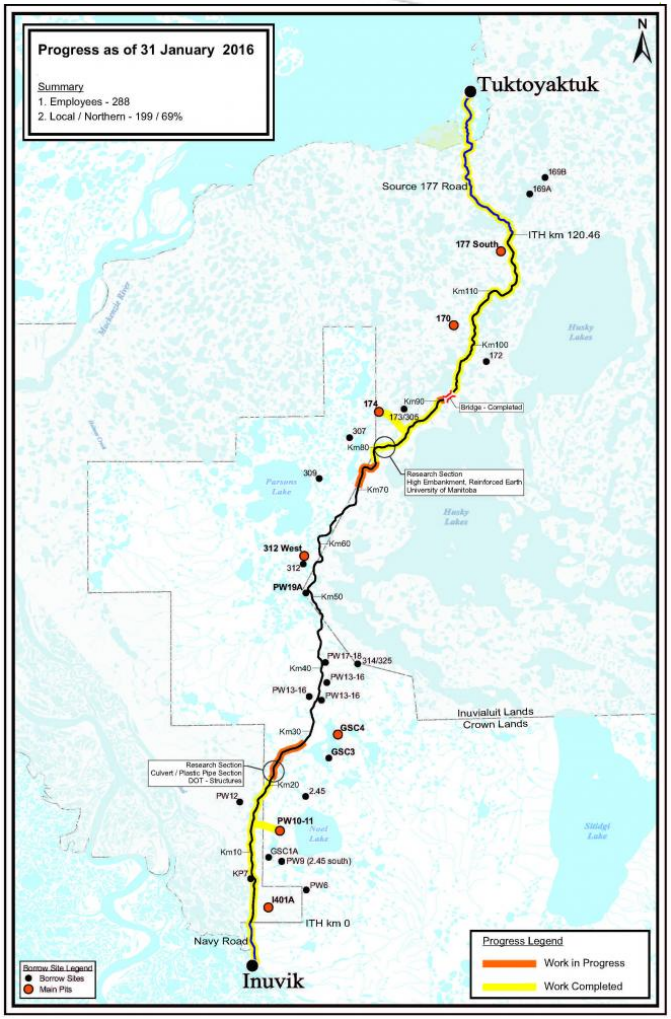
- Needs:
  - AVIRIS flight - Yellowknife-Cambridge Bay (via Baker Creek, Daring Lake, Bathurst & Bluenose East calving-summering grounds) and over the ERA
  - Support Ecological Land Classification at key sites including ERA
  - Collaborating with INAC to cost share these flights

Canadian Space Agency

- **SAR WG** of the Polar Space Task Group (PSTG) has committed to **support ABoVE**
- CSA will provide **free RadarSat 2 images** to ABoVE teams
- Two elements:
  - **Monitoring strategy** for entire ABoVE domain – blanket RadarSat2 coverage (~30m resolution) – need to identify best timing for this
  - **Specific Targets** for Imaging: need to compile list of requirements from teams that require RadarSat2 for their science
- POLAR and NASA will contact teams to assemble this information
- CSA will also present this to the PSTG so that **other agencies may support**.



Natural Resources: Needs & Contributions



GSC:

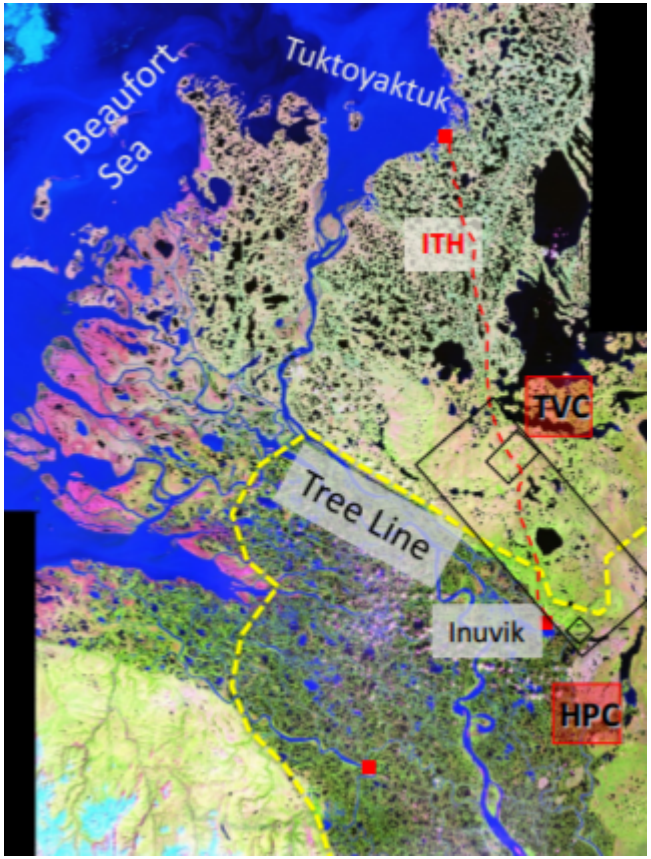
- **Domain-wide PF monitoring network:** existing/ongoing data (up to 30 year records: temp, ALT, geotech in YT, NT and Nu
- Continued 2017 monitoring of temp and ALT

CCRS:

- **Tuk Peninsula & Inuvik-Tuk Highway:** repeat-pass UAVSAR and AIRMOSS (L/P band) with RadarSat-2, UAV and field data
- Assess potential of L/P-band for PF characterization, peatland hydrology monitoring and for assessing cumulative impacts in western Canadian Arctic ecosystems.
- **Churchill to Resolute**: what can L-band and P-band SAR tell us about active layer thickness, depth to permafrost, active layer moisture content, permafrost and vegetation cover?

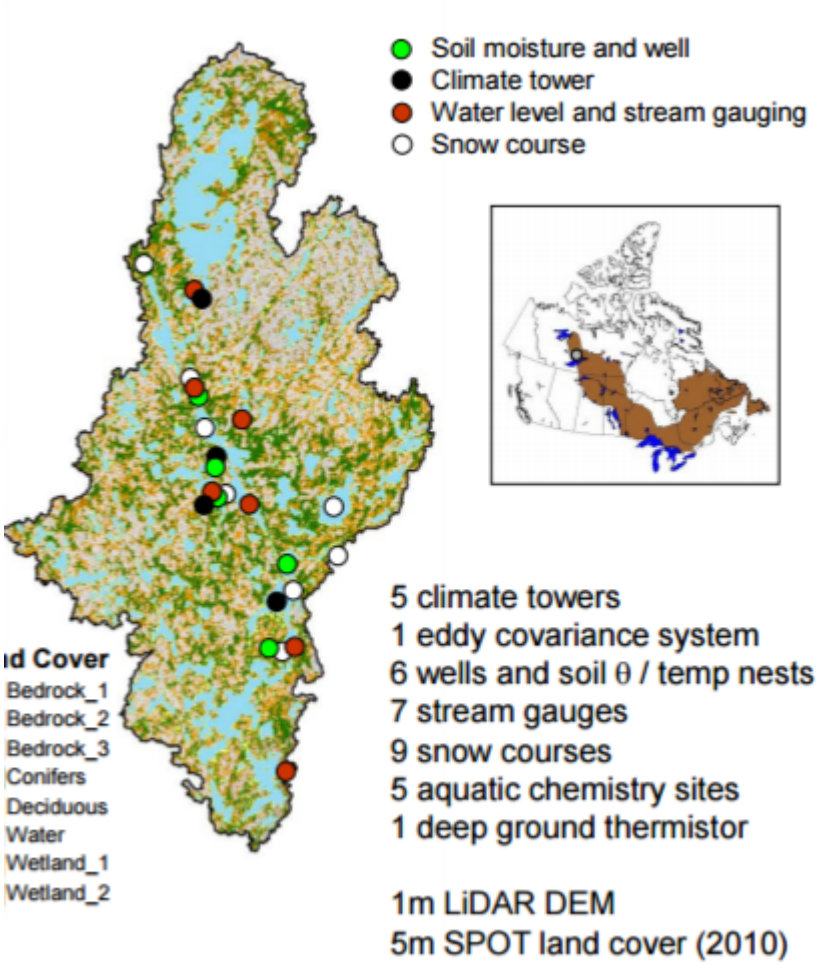
Environment and Climate Change Canada Needs & Contributions

- **Trail Valley Creek and Havikpak Creek:**
  - ECCC is leading or collaborating on airborne campaigns and process studies in support of snow remote sensing and modeling studies
- **Canadian portion of the ABoVE domain:**
  - ECCC operates in situ monitoring network (continuous and flask): CO2, CH4, CO
- **Full ABoVE domain:**
  - ECCC leads the development and validation of snow extent and snow mass products, and leads cal/val of the NASA SMAP freeze/thaw product



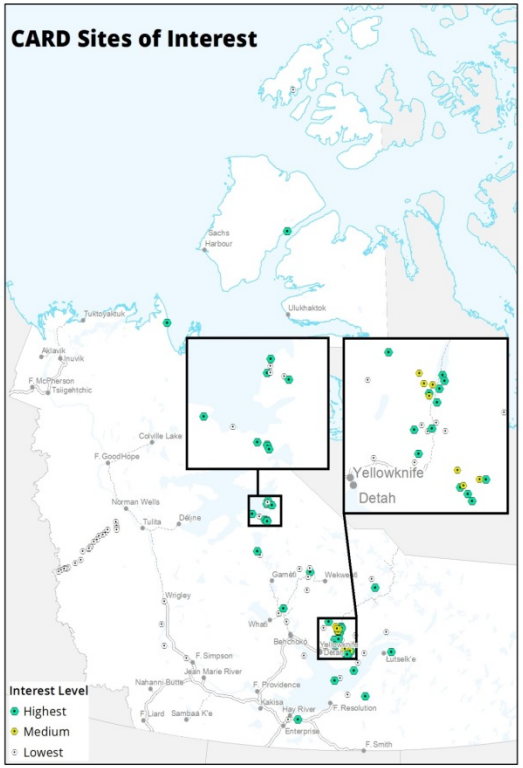
Environment and Climate Change Canada Needs & Contributions

- **Baker Creek Research Catchment (Yellowknife):**
  - Existing air photos, LiDAR, Radarsat, Quickbird, SPOT (e.g. identify veg changes, trends in ponded area related to PF extent).
  - Planned UAV flights over small areas to better resolve vegetation/permafrost relationship.
  - Interest in augmenting this with NASA Airborne data



Indigenous and Northern Affairs Canada Needs and Contributions

- **Indigenous and Northern Affairs Canada**
  - Monitoring/remediation of NWT contaminated sites (data: conditions of soil, water, biota including hydrology, geology, soil and air temperatures)
  - Monitoring: 5 times/yr to once every 5 years.
  - Interest in Airborne over key NWT sites
    - Calibration to determine if RS can be used for ongoing monitoring – cheaper and more effective and replace traditional site inspection.



Other

- **Canadian Museum of Nature:**
  - Numerous detailed floristic inventories ;
  - Opportunity to coordinate areas that they visit in next few years, so that floristic data can augment ABoVE project.
- **British Antarctic Survey:**
  - Twin-Otter flight in April over CHARS ERA:
    - Ka-band Radar
    - Scanning LiDAR (fly at 1000ft swath about 1000ft, resolution ~50cm in horizontal)
    - Camera and InfraRed probe for surface temps (looking down)
    - Radiometers (upward and downward looking)
  - Potential to plan more coordinated flights in subsequent years

Thank You!

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